

attributed to *R. limnocharis* and *R. hexadactyla*. Annandale<sup>1</sup> has rightly pointed out that *R. limnocharis* is quite incapable of performing this feat and that *R. hexadactyla* does so quite feebly on account of its large size.'

As regards my own observations of Indian frogs, I can assert, without any measure of doubt, that *Rana erythraea* frequently leaps over the surface of the water when alarmed. At Mymensingh, Bengal, in July 1944, I observed this species and made the following recording in my note-book:—'These batrachians were found in quite large numbers round the borders of some small ponds, chiefly amongst the vegetation. On being disturbed, they either swim away from the edge, or, more frequently, they jump away over the surface of the water in a manner akin to the habit of *Rana cyanophlyctis*. They are, however, very much lighter on the surface than *R. cyanophlyctis*, and appear to use this habit as much, or even more.' In the case of *cyanophlyctis*, the movement may be described as a 'skip' or 'shuffle' over the surface, but *erythraea* moves by a series of distinct jumps.

I suspect that *R. limnocharis* also sometimes practises this habit, though less frequently, and more after the manner of *R. cyanophlyctis*. My evidence on this point is, unfortunately, not quite conclusive.

96, MORTLAKE ROAD,  
KEW, SURREY,  
ENGLAND,  
25th February 1947.

J. D. ROMER, F.Z.S.

#### 24.—MATING AND THE PARENTAL INSTINCT OF THE MARSH CROCODILE (*C. PALUSTRIS* LESSON)

There is practically no scientific data on how Crocodiles mate, and I think, few people have seen crocodiles in the act of mating. It was not until recently this year that I could safely say that I had seen it. It was on the 19th March that my brother K. S. Nirmalkumarsinhji and I motored to the Shetrunji River. Here, at one of the deep 'Dharas' (deep pools) we saw two crocodiles swimming on the surface of the water, heading to meet each other. Then as they reached one another, one of them made a swirl as it turned round and dived. It reappeared some distance away and then followed the other until the leading crocodile dived. I have witnessed such behaviour time and again and since this was at the height of the mating season it was no surprise to me.

Then we drove to another 'Dhara' where we had news of two large crocodiles, and on arriving there, we waited for an hour without seeing anything. After lunch taking up my field-glasses I noticed a crocodile with head and tail out. I passed the glasses to my brother to have a look, remarking at the same time that one had already appeared. Looking in he said there were two and mating, and handed back the glasses. And there they were, head,

<sup>1</sup> Rec. Ind. Mus., Vol. XV, p. 122 (Bombay Streams Fauna).

neck and shoulders, one posed over the other, clearly visible. They ducked and reappeared two or three times in the same position, and I saw a lateral movement after which they separated. The crocodiles had definitely mated. The time taken must be about two to three minutes and it was then exactly 1-30 p.m. After separation both crocodiles submerged and surfaced at odd intervals until at 2-45 p.m. I saw them mating again. This time one crocodile surfaced and had its tail tip out. Then after 10 minutes it moved towards a sand bar where the water was about knee deep. I expected it to emerge but no; it remained stationary for at least another five minutes. Then the other crocodile surfaced and seeing its mate, immediately swam towards it. As it came closer to its partner, I distinctly saw it with closed mouth raise its head and neck high out of water, pointing its snout at an angle of about 70 degrees, for a few seconds. Then as the two met, I saw the male trying to mount and the female circling until the male actually mounted, gripping the female firmly. They were now in fairly deep water and I could only see their bobbing heads in and out of the water. At times only the female's snout was visible at others completely disappearing, reminiscent of duck (female) in mating. However, the male never attempted to grip the female with its jaws and when head and entire neck of both were visible, the angle was approximately the same. This lasted three minutes after which they completely submerged. The next I saw them they were about 60 feet apart. How long the two copulated under water I cannot say but they were submerged for at least five minutes. Nevertheless, what little I had seen of the mating of these reptiles was indeed a rarity. It is evident from this experience that mating may take place in water or perhaps on land by night, though I do not see how that would be possible. Judging from the heads, the two crocodiles were approximately the same size and between 7 and 8 feet in length. The males are on the average much slimmer than the females at this time of the year and I agree with Mr. McCann that fertilization must take place at quite an advanced stage when the ova are well developed. He had also surmised that mating takes place in water, as I had always believed, but lacked sufficient proof on the matter.

#### PARENTAL INSTINCT

The question is: Does the Crocodile take any parental interest? My answer is Yes—but only to a certain limit and when conditions necessitate it. Here I may make it clear that conditions for parental care may not arise at all: such as when the river is in flood or when the young have easy access to water without exposure to danger. From my experience, the parental instinct is aroused at the time of the eggs hatching, and lasts until the young crocodiles reach safety and are at home in the water. I have seen a female crocodile keep guard over the young on the day of hatching. This was revealed to me some years ago, when a particular crocodile kept to one area of the lake close to where

the eggs had evidently been deposited. And on the day I discovered the newly hatched young I saw this crocodile rush out of the water, at least a dozen times to drive away, Black-necked Storks (*Xenorhynchus*) Herons (*Ardea*) and large white Egrets (*Egretta*) when they ventured to alight near the young which were lying helpless at the water's edge. I watched this crocodile for the whole day maintaining a scrupulous guard over its young. This crocodile was afterwards shot and was confirmed to be a female. The general belief amongst the rural people here is that the parent crocodile eats its own young, but my observation does not support this belief, on the contrary the female seems to take great care of the young and sees them safe to the water, as the first few hours after hatching are the most critical in the life of the young crocodile.

Another observation that I have made is that, wherever a crocodile has deposited her eggs, she is in the proximity of the site. Although I now regret having shot so many crocodiles without taking a deeper interest in their life history, I am still inclined to believe that the parental instinct (restricted to the female) is aroused by the grunting sound made by the young at the time of hatching, immediately before and after emerging from the eggs. Those who have the opportunity to make systematic studies on the parental behaviour of *C. palustris* will, I feel, find the problem most interesting besides throwing much light on the subject, still unknown.

BHAVNAGAR,  
10th April 1947.

K. S. DHARMAKUMARSINHJI

[Parental instinct in the great Estuarine Crocodile (*C. porosus*) is well known and there are records showing how assiduously the species guards her 'nest' of eggs and new born young. Little has been observed regarding the mating habits and parental care of the Common Mugger (*C. palustris*).—EDS.]

## 25.—INDIAN MONITORS IN THE UNITED PROVINCES.

Reference Mr. F. W. Champion's note on the above in volume xxxvii No. 3 of 1934.

It may be of interest to note that *Varanus monitor*, is now reasonably plentiful below Lansdowne Cantt. between 4000 ft. and 5000 ft. It is my misfortune to have to travel frequently between Lansdowne and Kotdwara by car, (the road is appalling), and it is seldom that one does not see at least one specimen.

I can confirm what Mr. Champion says about the breeding season for early in June last year I saw an exceptionally large specimen that was obviously gravid, and so 'heavy' that it had difficulty in getting out of the way of my Jeep.

For many years a large *Goh* lived under the water tanks in our Mainwaring Lines—from 1921 to 1927. The Burma Rifles who relieved my battalion here in 1927 ate this one within a week of their arrival.